Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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DELETE, DELETE, DELETE	)	GN Docket No. 25-133
	)	
	)	

To: The Commission

COMMENTS OF
THE BOEING COMPANY

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SUMMARY

Deleting Unnecessary Part 18 Regulations

Consistent with the Commission's goal of deleting unnecessary and burdensome regulations, The Boeing Company ("Boeing") recommends that the Commission streamline its rules governing the use of ultrasonic and digital components in transportation vehicles to assist manufacturers and promote U.S. commerce. Rapid technological developments are taking place with respect to the use of wireless systems, digital processing, and sensors as components in cars, trucks, aircraft, and maritime vessels to enable them to operate in a more safe and efficient manner. Radio frequency ("RF") emissions from these devices are generally negligible, posing no appreciable risk of harmful interference to other authorized uses of radio spectrum.

Presently, 47 C.F.R. § 15.103 exempts from the Commission's technical standards and equipment authorization requirements for digital components used in a wide variety of products and equipment, including aircraft, automobiles, home appliances, and specialized medical equipment. The Commission should create an identical exemption from its technical standards and equipment approval requirements for industrial, scientific, and medical ("ISM") devices used as components for operational and monitoring purposes in transportation vehicles.

The operating conditions of these ISM components are very similar to the operating conditions of digital devices employed by vehicle manufacturers. The Commission already created such an exemption for ISM equipment employed in specialized medical devices, establishing a strong precedent for adopting this same exemption for vehicle components. The Commission should also create an explicit exemption in Section 15.103 of its rules for digital components employed within maritime vessels, particularly autonomous maritime vessels that are rapidly being developed for both surface and submersible operations.

Deleting Unnecessary Part 87 Aeronautical Radio Requirements

Boeing also recommends that the Commission delete the first sentence of 47 C.F.R. § 87.73, which requires that an individual holding a general radiotelephone operators license ("GROL") "must directly supervise and be responsible for all transmitter adjustments or tests during installation, servicing or maintenance of a radio station."[1] This rule has long outlasted its usefulness, imposing a significant burden on companies engaged in the assembly and maintenance of aircraft. The presence of a licensed GROL is no longer needed during the installation, servicing, or maintenance of an aircraft radio because all such devices are now modular in construction, with online or over-the-air remote diagnostics, no serviceable parts, and only a few (often only two) external connection points. If a problem with an aircraft radio is identified during the installation or maintenance process, the radio is removed from the aircraft and shipped to a servicing center. No effort is made to disassemble or repair an aircraft radio in the field.

GROL licensees are not only unnecessary in aircraft assembly, but they are also difficult to identify and retain. A GROL license is relatively hard to secure, requiring testing on multiple subjects that have nothing to do with the installation of aircraft radios. Perhaps for this reason, the number of individuals securing general radiotelephone operators licenses has dropped dramatically in recent decades, placing an even greater burden on both small and large companies engaged in the assembly, maintenance, and servicing of aircraft. The Commission should therefore delete the outdated requirement codified in the first sentence of Section 87.73 since it is burdensome and has no residual useful purpose.

[1] 47 C.F.R. § 87.73.

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The Boeing Company ("Boeing"), through its counsel and pursuant to the Commission's Public Notice,[2] hereby supports the deletion of two sets of rules that no longer serve a practical purpose and impose a substantial financial and administrative burden on the U.S. transportation and autonomous vehicle industries. Boeing urges the deletion or modification of the following rules:

First, the Commission should dramatically reduce the regulatory burdens imposed by Part 18 of its rules by modifying Section 18.121 (Exceptions) to additionally apply to Part 18 devices that are installed and used in the monitoring and control systems of transportation vehicles, including autonomous aircraft and maritime vessels.

Second, the Commission should update its rules for aircraft by deleting the first sentence of Section 87.73 of its rules, which states: "[a] general radiotelephone operator must directly supervise and be responsible for all transmitter adjustments or tests during installation, servicing or maintenance of a radio station."[3]

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[2] Public Notice, *In Re: DELETE, DELETE, DELETE,* DA 25-19, GN Docket No. 25-133 (March 12, 2025).

[3] 47 C.F.R. § 87.73.

These highly technical and discrete regulations are precisely the type of rules that the President criticized as "complicated Federal regulation[s]" that are "difficult for the average person or business to understand."[4] Regulations such as these also "create[] a substantial restraint on our economic growth and ability to build and innovate, and hampers our global competitiveness."[5] The implementation of these changes would, therefore, provide substantial benefit to the U.S. transportation industry by reducing the cost of manufacturing in a variety of sectors, including aircraft and maritime vessels without imposing any increased risk to public safety. Boeing urges the Commission to adopt each of these proposals promptly.

I. SUBSTANTIAL PRECEDENT AND GOOD CAUSE EXISTS TO EXEMPT FROM MANY OF ITS PART 18 REGULATIONS SENSORS AND CONTROL SYSTEMS THAT ARE INCREASINGLY USED IN VEHICLES

One of the most significant technological challenges of this generation is the use of wireless systems, digital processing, autonomous controls and sensors to further heighten the operational safety and efficiency of aircraft and maritime vessels. Autonomous and semi-autonomous vehicles employ a substantial number of electronic components that use RF energy at very low power levels for internal monitoring, short range communications, and to perform other important control functions. These electronic devices monitor and control the operations of the vehicle, monitor conditions around the vehicle, and produce data that is communicated to the vehicle operator and often to adjacent vehicles. RF emissions from these myriad devices are generally negligible, posing no appreciable risk of harmful interference to other authorized uses of radio spectrum, be they

[4] Executive Order 14192 of January 31, 2025, Unleashing Prosperity Through Deregulation, 24 Fed. Reg. 9065, § 1 (Feb. 6, 2025) ("Executive Order 14192").

[5] *Id.*

devices outside the vehicle, consumer devices carried by passengers within the vehicle, or the various other RF components that are incorporated with the vehicle itself.

Despite these uniform characteristics, the Commission has historically maintained two separate bodies of rules to govern the use of small digital devices that emit low levels of RF energy in their operations – those that are used for data processing and short range communications (which are generally regulated under Part 15) and those that are used for industrial, scientific, and medical ("ISM") purposes (which are regulated under Part 18). This divergent regulatory treatment is based solely on the differences in use, not because of appreciable differences in their potential impact on the interference environment.

Vehicle components governed under Part 15 of the Commission's rules have long been subject to a streamlined regulatory structure, which recognizes that transportation vehicles are designed with thousands of parts and components, all of which must operate in concert with each other toward a single purpose – the safe and reliable operation of the vehicle. In contrast, vehicle components governed under Part 18 of the Commission's rules do not receive this same streamlined regulatory treatment even though their RF emission characteristics are often identical to, if not more minute than, those of Part 15 devices.

Boeing therefore urges the Commission to streamline its rules to support the important technological developments that are taking place in autonomous operations. A reduction in regulatory impediments to the use of small wireless and digital devices in autonomous vehicle systems would advance the President's directive "to significantly reduce the private expenditures required to comply with Federal regulations to secure America's economic prosperity and national security and the highest possible quality of life for each citizen."[6]

[6] *Executive Order 14192*, § 1.

The streamlining measures that Boeing proposes entail relatively modest changes to the Commission's rules that would be entirely consistent with regulatory provisions that already exist. Specifically, the Commission should adopt the following changes to its rules:

- Expand the scope of Section 18.121 (Exemptions) to indicate that ISM equipment used exclusively in the monitoring and control systems of any transportation vehicle (but not to power the vehicle) are subject only to the provisions of Sections 18.105, 18.109 through 18.119, 18.301 and 18.303 of Part 18.

- Supplement Sections 15.103(a) and 18.121 to explicitly indicate that digital devices used exclusively within maritime vessels are subject only to the general conditions of operation in Sections 15.5 and 15.29 (or Sections 18.105, 18.109 through 18.119, 18.301 and 18.303) and are exempt from the specific technical standards and other requirements contained in Parts 15 and 18 of the rules.

The adoption of these streamlining measures would greatly assist vehicle manufacturers, along with the thousands of their suppliers of RF components that are incorporated within vehicles, to enhance their operational performance, efficiency, and safety.

A. The Commission's Long Standing Exemption for Part 15 Components Used in Transportation Vehicles Has Been Extremely Successful in Prompting Their Beneficial Use

Since the late 1970s, the Commission has imposed testing and certification requirements on small digital devices that are incorporated within the electronics of a wide variety of products including home appliances, toys and entertainment systems, computers, manufacturing systems, and other useful equipment. These rules, codified in Section 15.109, exist to prevent RF emissions from these devices to radiate (or leak) at levels that could interfere with sensitive communications equipment, such as over-the-air radio and television reception.[7]

[7] *See* Amendment of Part 15 to Redefine and Clarify the Rules Governing Restricted Radiation Devices and Low Power Communication Devices, *First Report*, FCC 79-555 (Oct. 11, 1979).

Shortly after the Commission adopted its rules for digital devices, the Commission recognized the need to create exemptions for digital devices incorporated in transportation equipment, specifically automobiles and aircraft.[8] Pursuant to these exemptions, such components are subject only to the general requirement to refrain from causing harmful interference.[9] The Commission explained that this exemption was warranted because special testing procedures would likely be needed for such devices, the potential benefits of which would unlikely be justified by the costs.[10]

In 1981, the Commission created an additional exemption for specialized medical digital devices.[11] The Commission observed that an exemption was justified "particularly in view of the many factors which minimize the likelihood of interference, and in view of the high costs of compliance."[12] Today, the Commission maintains a lengthy list of digital devices that are exempt from its Part 15 testing and certification requirements, including devices used in:

(a) transportation vehicles including motor vehicles and aircraft;

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[8] *See* Amendment of Part 15 to Redefine and Clarify the Rules Governing Restricted Radiation Devices and Low Power Communication Devices, FCC 80-148, *Order on Reconsideration*, 79 F.C.C.2d 67, ¶¶ 54-55 (April 9, 1980) ("*1980 Order on Reconsideration*").

[9] *See* 47 C.F.R. § 15.103 (explaining that such devices are subject only to the general conditions of operation in §§ 15.5 and 15.29). The exemptions that are currently included in Section 15.103 were originally codified as temporary exemptions in Section 15.801 of the Commission's rules. *See* Revision of Part 15 of the Rules Regarding the Operation of Radio Frequency Devices Without an Individual License, FCC 89-103, *First Report and Order*, 4 FCC Rcd 3493, ¶ 141 n.61 (Apr. 18, 1989) (moving the exemptions from Section 15.801 to Section 15.103 of the Commission's rules and making the exemptions permanent).

[10] *See 1980 Order on Reconsideration*, ¶ 55.

[11] *See* Request of General Electric Company to Exempt Medical Diagnostic Equipment From Subpart J of Part 15 of the Rules of the Federal Communications Commission, FCC 82-301, *Report and Order*, 90 F.C.C.2d 666 (July 9, 1982).

[12] *Id.*, ¶ 13.

(b) electronic control or power systems used by a public utility or in an industrial plant;

(c) industrial, commercial, or medical test equipment;

(d) appliances, *e.g.*, microwave oven, dishwasher, clothes dryer, air conditioner, etc.;

(e) specialized medical digital devices;

(f) devices that have a power consumption not exceeding 6 nW;

(g) joystick controllers or similar devices, such as a mouse; and

(h) certain devices in which both the highest frequency generated and the highest frequency used are less than 1.705 MHz.[13]

With respect to all of these digital devices, the exemption was warranted based on "evidence indicating that the risk of interference was minimal and that the cost of compliance with a specific emanation requirement would be high."[14]

The existence of these exemptions has permitted equipment manufacturers to incorporate digital devices governed under Part 15 in a myriad of products and systems without resulting in harmful interference to other important spectrum uses. This general absence of harmful interference is due to several factors. Many digital devices are incorporated within larger products that include outer casings or chassis that effectively shield much of the radiated emissions. Many of these larger products also incorporate multiple RF components within them that must be shielded from each other to ensure the reliable operation of the larger product. In addition, some of the products that contain exempted digital devices are used in medical, aviation, and industrial settings where trained personnel can manage their placement and operation. Finally, RF emissions

[13] 47 C.F.R. § 15.103.

[14] Amendment of the Exemptions in Subpart J of Part 15 of the Commission Rules for Controlling the Interference Potential of Computers and Similar Electronic Equipment, FCC 84-401, *Notice of Proposed Rulemaking*, 98 F.C.C.2d 1211, ¶ 7 (Aug. 21, 1984).

from most of these exempted digital devices are so low that they would not create an interference concern regardless of how or where they are used.

As a result, the Commission's streamlined treatment of exempted digital devices under Part 15 of its rules has been tremendously successful. Digital devices generally do not cause harmful interference into licensed or unlicensed wireless systems. At the same time, manufacturers have been able to incorporate inexpensive digital devices into nearly all types of products and equipment, enabling those products to operate more effectively and efficiently, using less power and providing more services to consumers than could ever have been possible without these computing capabilities.

Given the Commission's tremendous success in this area, Boeing urges the Commission to modify its rules and employ these same principles to Part 18 ISM equipment that is used in the monitoring and control systems of transportation vehicles ("ISM Vehicle Components"). The expansion of the Commission's exemptions in this manner will further encourage their incorporation and use within increasingly autonomous vehicles that are made available by manufacturers to benefit consumers and commerce in the United States.

B. The Commission Should Adopt the Same Exemptions for ISM Vehicle Components

As noted above, a significant percentage of the sensors and operational components that are incorporated into vehicles are regulated under Part 18 of the Commission's rules because of the manner in which they use spectrum, not because of their potential to cause harmful interference to other devices. ISM devices use radio energy to produce physical, biological, or chemical effects such as heating, ionization of gases, mechanical vibrations, hair removal, and acceleration of

charged particles.[15] Despite these different uses, most ISM devices pose no greater risk of harmful interference than other RF devices governed under Part 15 of the Commission's rules.

Many ISM systems are incorporated within larger products that include outer casings or chassis that effectively shield emissions. Some of these larger products also incorporate multiple other RF components, necessitating that these components be shielded from each other. Further, RF emissions from most ISM devices are so low that they would not create an interference concern regardless of how or where they are employed. Given these facts, the Commission should adopt in Part 18 of its rules the same exemptions for ISM Vehicle Components that it maintains in Section 15.103 of its rules for digital devices used in transportation vehicles.[16]

Precedent exists for the Commission's treatment of ISM equipment in the same streamlined manner as exempted digital devices. In 1986, the Commission adopted an exemption for non-consumer medical ultrasonic equipment from the Part 18 regulatory test requirements.[17] In 1994, the Commission expanded this exemption to include non-consumer magnetic resonance

[15] *See* 47 C.F.R. §18.107(c).

[16] In submitting this request, Boeing emphasizes that it is not seeking exempted treatment for any RF emitting devices (be they regulated under Part 18 or Part 15) that are used to power electric vehicles, or any consumer devices within those vehicles. Boeing is aware that the Commission has separately addressed the regulatory requirements for inductive and short range charging devices that are used to transfer electrical energy through induction or through free space to charge the fuel cell batteries of electric cars, or the batteries of consumer devices within those cars. These comments focuses solely on Part 18 ISM devices used in the monitoring and control of transportation vehicles and does not seek to address the more complex issues regarding RF equipment used in an electric vehicle's power system.

[17] *See* Amendment of Part 18 of the FCC Rules to exempt medical ultrasonic diagnostic and monitoring equipment from technical standards, FCC 86-493, *Report and Order*, 1 FCC Rcd 553 (Nov. 12, 1986) ("*1986 Part 18 Order*").

equipment.[18] Proponents of these exemptions highlighted the fact that RF emissions produced by the ultrasonic portions of such equipment were comparable to RF emissions from the digital processing portions of these same devices, the latter of which had already been exempted by the Commission from the Part 15 regulatory test requirements.[19] In concurring with this position, the Commission observed that the interference risks of such an exemption were minimal and the reduced costs to medical equipment manufacturers would be significant.[20]

The Commission should reach this same conclusion with respect to ISM Vehicle Components. Most such devices are not modular, meaning they cannot be tested as separate devices prior to their incorporation into aircraft or other transportation systems. Further, such components do not generate RF energy in their unassembled state. Thus, testing such components prior to their installation on a transportation vehicle is difficult. Once assembled as a part of the vehicle, testing can become even more difficult because the component is often housed deep within the vehicle frame.

As an example, Boeing installs ultrasonic water detectors within the fuel tanks of large aircraft. Once installed, RF emissions from these sensors are largely undetectable outside the fuel tanks. For this reason, it is both impractical and unnecessary to continue to impose the Part 18 technical standards and equipment approval rules to these sensing devices.

As a second example, ultrasonic sensors are being installed in both cars and aircraft that are used to detect the proximity of the vehicle to external objects, such as other cars or taxiing

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[18] *See* Amendment to Part 18 to Remove Unnecessary Regulations Regarding Magnetic Resonance Systems, FCC 94-155, 9 FCC Rcd 3389 (July 12, 1994) ("*1994 Part 18 Order*").

[19] *1986 Part 18 Order*, ¶¶ 2 and 4.

[20] *See id.*, ¶ 6; *see also 1994 Part 18 Order*, ¶ 6.

aircraft, pedestrians, or fixed objects. These sensors use RF energy to generate ultrasonic signals, but RF emissions from such devices are negligible.

As a third example, Boeing equips all major aircraft with ultrasonic emergency locator beacons, which activate only in the extremely unlikely event of being submerged in water. The beacons are Part 18 devices because they use RF energy to generate an underwater acoustic beacon and do not transmit an RF signal. Importantly, given the fact that the devices are activated only when submerged in water, they pose no interference threat to other spectrum uses and therefore should appropriately be treated as exempted devices.

Numerous other vehicle components employ ISM technology for monitoring and control systems. In designing aircraft to incorporate such components, Boeing employs extreme diligence to ensure that any RF emissions that leak from such components are adequately shielded so they cannot affect critical communication and navigation systems, other RF components, or consumer devices that are permitted within the cabin of the aircraft. Boeing also completes thorough RF emissions testing of the entire aircraft once it is assembled to ensure that RF transmissions produced either within the aircraft or from external sources do not interfere with the safe, effective, and reliable operation of aircraft flight systems. Boeing anticipates that manufacturers of other transportation vehicles take similar precautions.

Countless examples exist of ISM technologies that are employed in products and equipment in a manner that do not pose a risk of harmful interference to other spectrum uses. The Commission should therefore apply the same exemption that it employs for digital devices to all ISM equipment used exclusively on transportation vehicles in order to promote the expanded use of such technologies by manufacturers.

C. Exempting ISM Vehicle Components Would Eliminate a Substantial Burden for the Transportation Industries

The existing divergent regulatory structure between RF emitting devices regulated under Part 15 versus Part 18 of the Commission's rules imposes a tremendous regulatory burden on manufacturers and their suppliers in the transportation industries. Boeing and other manufacturers of increasingly complex transportation vehicles are faced with a constant compliance challenge of ascertaining the appropriate regulatory status of each component employed in a vehicle – many components fall within multiple classifications, including both Part 15 and Part 18 – and educating suppliers on the testing, equipment authorization, and importation requirements for each device.

As a global leader in the design and manufacture of aircraft and aerospace systems, Boeing employs a very wide range of wireless systems, including for research and development, for worker safety and automated manufacturing, for aircraft flight testing, and incorporated within the operational systems of each aircraft, defense system, and space vehicle manufactured by Boeing. Boeing is leading the aviation industry in the field of unmanned aircraft systems ("UAS"), including advocating for the safe design and integration of wireless monitoring and sensing systems that support perception, machine learning, and advanced flight control systems. Boeing's UAS can be customized with mission-specific technologies for a wide range of tasks, including search and rescue, disaster response, asset and force protection, border security, wildlife monitoring, agricultural assessment, communications relay, anti-piracy, and firefighting.

Boeing is also a leader in the development of autonomous maritime systems used for surveillance, exploration, security, and scientific research in remote oceanic regions. Boeing's Liquid Robotics subsidiary manufacturers autonomous ocean robots that are powered by energy harvested from the sun and ocean waves, and are equipped with a wide assortment of sophisticated

sensors to measure water temperatures, oxygen levels, pH levels, salinity, turbidity, conductivity and underwater acoustics.

To support its varied research and manufacturing efforts, Boeing purchases millions of components from its immense supply chain and engages in exhaustive efforts to confirm the equipment verification or certification status of each of these devices, often having to educate technology vendors regarding the complexities of the Commission's equipment approval and importation rules. Other large manufacturers face the same challenges.

Boeing therefore urges the Commission to streamline its Part 18 rules for ISM Vehicle Components to enhance their safety, efficiency, and autonomous capabilities. Such measures would remove costly, administratively burdensome and unnecessary regulations on U.S. manufacturers and high tech developers, thus facilitating the continued growth and U.S. leadership in these critical industries to the substantial benefit of domestic consumers and to the role of the United States in international trade.

D. The Commission Should Confirm its Exemption for RF Emitting Components used in Maritime Vessels

As the Commission is aware, rapid technological developments are currently taking place with respect to aircraft and automobiles involving the use of wireless systems, digital processing, and sensors to enable them to operate in a more safe and efficient manner. Less well known is that these same technological developments are taking place in the maritime sector, where autonomous surface and submersible vessels are already being deployed for various beneficial purposes. These autonomous vessels employ large numbers of wireless systems, digital processors, and ultrasonic sensors to navigate, operate safely, and execute their missions.

Given the fact that these vessels are autonomous, their operations pose no risk of harmful RF interference to individuals or other authorized spectrum uses. Nevertheless, the Commission's

rules currently do not include an explicit exemption from the technical standards and equipment authorization requirements for the various Part 15 and Part 18 components that they contain. Boeing therefore recommends that the Commission clarify or create an explicit exemption in Section 15.103 of its rules for digital devices that are employed within maritime vessels. Consistent with Boeing's comments above, this new exemption should also be applied to Part 18 ISM Vehicle Components.

Further, it would be justifiable to apply this new exemption to all forms of maritime vessels, not just those that operate autonomously. The Commission's existing exemptions for aircraft and automobile components have not resulted in appreciable interference to other authorized spectrum uses. There is no reason why an exemption for components employed on maritime vessels would produce a different result. Instead, maritime vessels are usually much larger and spacious than aircraft or automobiles, with much greater segregation between the areas designated for passenger and the vessel's operational systems. Therefore, an exemption for components used in all maritime vessels would be warranted.

If the Commission is hesitant to adopt an exemption for all maritime vessels, Boeing would urge the Commission to adopt expeditiously an exemption solely for autonomous maritime vessels, including both surface and submersible vessels. Such an exemption would provide immediate benefits to equipment manufacturers by permitting them to employ wireless sensors and ultrasonic equipment more expeditiously and in greater quantities on autonomous vessels to further enhance their operations and their ability to operate in a safe and efficient manner.

II. THE COMMISSION SHOULD DELETE THE OUTDATED REQUIREMENT THAT A LICENSED GENERAL RADIOTELEPHONE OPERATOR MUST BE PRESENT DURING THE INSTALLATION OR MAINTENANCE OF AN AIRCRAFT RADIO

The Commission should also delete an outdated rule that inhibits the assembly and maintenance of aircraft in the United States. Section 87.73 requires in part that "a general radiotelephone operator must directly supervise and be responsible for all transmitter adjustments or tests during installation, servicing or maintenance of a radio station."[21] This requirement likely had significant efficacy back when a substantial amount of wiring and manipulation was involved in the installation or servicing of an aircraft radio. The requirement, however, has no useful purpose in the current aviation industry in which all radios are modular, with online or over-the-air remote diagnostics, no serviceable parts, and only a few (often only two) external connection points.

Exacerbating the burden imposed by this rule, a general radiotelephone operators license or "GROL" is difficult to secure, requiring testing on a range of subjects that have nothing to do with the installation of aircraft radios, including the properties of electrical components (*i.e.*, transistors, capacitors, and inductors) and the proper operation of radios and radars on ships at sea. Perhaps for this reason, the number of individuals securing GROL authorizations has dropped dramatically in recent decades, placing an even greater burden on both small and large companies engaged in the assembly, maintenance, and servicing of aircraft. The Commission should therefore delete this outdated requirement since it is exceedingly burdensome and has no residual useful purpose.

[21] *See* 47 CFR § 87.73.

A. Specialized Expertise is No Longer Required to Install, Test, or Maintain Aircraft Radios

Radios used today in both small and large aircraft are entirely modular, with no serviceable components and few external connection points. The assembly of radio systems inside a modern aircraft involves running the wire harnesses, affixing the radios to the aircraft panel in the cockpit, and connecting the cable connectors to the back of the radios (if the connectors are not already hard wired into the support frame that holds the radios). Once installed, the radios can be tested using either online or over-the-air diagnostic software and/or through an audible radio check, often using test frequencies designated for such purposes.

Boeing, for example, conducts over-the-air audio checks for each radio installed on new aircraft using designated test frequencies, very lower transmission levels (*i.e.*, 100 mW for VHF), and test transceivers positioned close to the aircraft, usually within the same building. If a problem with the radio is identified during verification, the radio is either corrected using an online diagnostic tool or removed from the aircraft and sent back to the manufacturer for servicing. No attempt is made to disassemble or repair the radio in the field.

In making these points, Boeing is not minimizing the importance of ensuring the proper installation and verification of an aircraft radio system. Thorough training, close attention to detail, and redundant verification are all critical. What isn't required, however, is the skills necessary to build a radio from scratch, or to operate a radio on a ship at sea. Yet, these are precisely the skills that seem to be required to pass the GROL exam, imposing a significant burden on identifying and retaining GROL licensees in the aircraft assembly and maintenance industry.

B. The GROL License Exam Questions are Generally Unrelated to the Skills Needed to Install, Test or Maintain a Modern Aircraft Radio

To secure a GROL authorization, an applicant must complete the FCC's commercial operator's exam, which is administered by private companies. The GROL exam consists of two elements (Written Elements 1 and 3), neither of which seem relevant to the installation and testing of aircraft radios.

As stated on the FCC's website, Element I covers "[b]asic radio law and operating practice with which every *maritime radio operator* should be familiar."[22] Only five of the sample questions published by the FCC (there are more than one hundred) mention aircraft radios. The vast majority focus on the proper operation of a radio on a ship at sea, which is not surprising, as a GROL authorization is also required to maintain a maritime radio. Sample questions require knowledge on such issues as the types of radios required on different vessels, the minimum transmit power for a ship at sea; the radios used in international waters and in the Great Lakes; the use of a bridge-to-bridge station; TELEX calls to public coast stations; operations of the GMDSS and the COSPAS-SARSAT system; the International Phonetic Alphabet; SOLAS regulations; the differences between Safety, Urgency, and Distress communications; and maintaining a ship's service and maintenance log.

Element 3 of the FCC's license exam consists of one hundred questions addressing "electronic fundamentals and techniques required to adjust, repair, and maintain radio transmitters and receivers."[23] The topics include: operating procedures, radio wave propagation, radio practice, electrical principles, circuit components, practical circuits, signals and emissions, and antennas

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[22] *See* https://www.fcc.gov/wireless/bureau-divisions/mobility-division/commercial-radio-operator-license-program/examinations (last visited March 31, 2025) (*emphasis added*).

[23] *Id.*

and feed lines.[24] As this list suggests, the knowledge required to pass Element 3 are those normally held by an electrician with sufficient skills to build a radio from scratch. Sample test questions include:[25]

3-17B1 What is the impedance of a network composed of a 100-picofarad capacitor in parallel with a 4000-ohm resistor, at 500 KHz? Specify your answer in polar coordinates.

A. 2490 ohms, /51.5 degrees
B. 4000 ohms, /38.5 degrees
C. 5112 ohms, /-38.5 degrees
D. 2490 ohms, /-51.5 degrees

3-20C2 In Figure 3C4, if a small variable capacitor were installed in place of the dashed line, it would?

A. Increase gain.
B. Increase parasitic oscillations.
C. Decrease parasitic oscillations.
D. Decrease crosstalk.

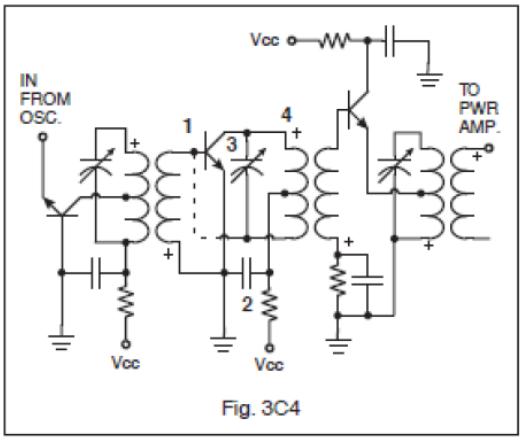


Fig. 3C4

3-34E2 What is a characteristic of a NAND gate?

A. Produces a logic "0" at its output only when all inputs are logic "0".
B. Produces a logic "1" at its output only when all inputs are logic "1".
C. Produces a logic "0" at its output if some but not all of its inputs are logic "1".
D. Produces a logic "0" at its output only when all inputs are logic "1".

[24] *Id.*

[25] The answers are: 3-17B1: D, 3-20C2: C, 3-34E2: D, 3-79L1: A.

3-79L1 When soldering or working with CMOS electronics products or equipment, a wrist strap:
A. Must have less than 100,000 ohms of resistance to prevent static electricity.
B. Cannot be used when repairing TTL devices.
C. Must be grounded to a water pipe.
D. Does not work well in conjunction with anti-static floor mats.

Some of the sample test questions for Element 3 are directed at aircraft communications equipment, but these questions seem far more relevant to an individual designing an aircraft communications system rather than installing and testing one. Sample questions include:[26]

3-68K1 What is the frequency range of the Distance Measuring Equipment (DME) used to indicate an aircraft's slant range distance to a selected ground-based navigation station?
A. 108.00 MHz to 117.95 MHz.
B. 108.10 MHz to 111.95 MHz.
C. 962 MHz to 1213 MHz.
D. 329.15 MHz to 335.00 MHz.

3-70K4 What type of antenna is used in an aircraft's Instrument Landing System (ILS) glideslope installation?
A. A vertically polarized antenna that radiates an omnidirectional antenna pattern.
B. A balanced loop reception antenna.
C. A folded dipole reception antenna.
D. An electronically steerable phased-array antenna that radiates a directional antenna pattern.

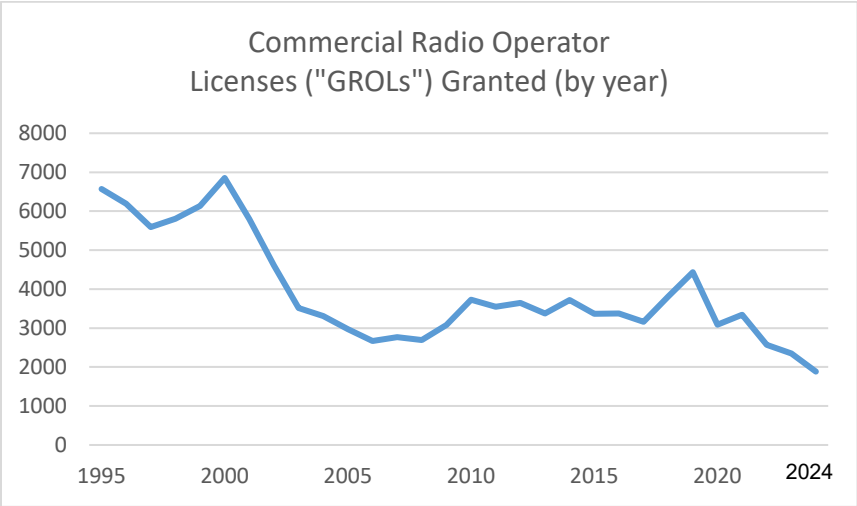
The significant level of expertise reflected by the questions in Elements 1 and 3 are clearly appropriate for certain activities, including the design and shipboard operation of radio systems. However, they far exceed and are generally irrelevant to the training needed to install and test radio systems on aircraft. Possibly for this reason, the number of GROL licenses issued by the Commission has dropped dramatically in recent decades.

C. The Number of GROL Authorizations Granted by the Commission has Dropped Dramatically

As noted above, GROL licenses are issued by the Commission following an applicant's certification that it has passed the test elements discussed in the prior section. The rapid decline in

[26] The answers are: 3-68K1: C, 3-70K4: C.

the number of applicants completing this process each year is reflected in the following graph, which tracks the number of GROL authorizations issued by the Commission each year from 1995 to the end of 2024:[27]



As reflected above, the number of individuals securing GROL authorizations has dropped from around 6,000 each year several decades ago to a low of 1,883 in 2024. This dramatic reduction, however, masks the true extent of the reduction in GROL licensees specializing in aviation services. As noted above, a GROL authorization is also required for the installation and maintenance of a radio on a maritime vessel, which is understandable. Radios on ocean vessels experience harsh operating environments with exposure to salt water and other harmful elements. Maritime radios also often must be repaired enroute if they fail.

Likely for this reason, an informal review of the GROL authorizations granted by the Commission in recent years evidences that a substantial number of applicants may have secured their licenses for work in the maritime industry. Many GROL applicants additionally secure Ships

[27] This data was drawn from the FCC's Universal Licensing System (https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp) by searching for "Commercial Operator (CM)" licenses and culling them to only include active licenses issued with the prefix "PG" for General Radiotelephone Operator licenses.

Radar endorsements and/or completed the test process using private test entities that specialize in marine services.

As a result, the number of GROL licensees available for work in the aviation industry continues to shrink, placing a substantial burden on aircraft maintenance companies and manufacturers. The Commission should therefore delete the first sentence of Section 87.73 and no longer require the presence of a GROL to supervise and be responsible for transmitter adjustments or tests during installation, servicing, or maintenance of an aircraft radio station.

III. CONCLUSION

Boeing applauds the Commission's efforts to delete outdated and unnecessary regulations to encourage the growth and success of industry and commerce in the United States. Consistent with this goal, the Commission should grant exceptions to many of its Part 18 regulations governing the assembly and use of ISM devices in transportation vehicles. The Commission should also delete the first sentence of Section 87.73 to remove the unnecessary requirement that a licensed GROL must directly supervise and be responsible for aircraft radio installation, servicing, and adjustments.

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